Remarks

This is in response to the Office Action mailed on October 8, 2002. Claims 1 and 22 have been amended, support for the amendments being found in Figures 1-3 and 7-11 of the present application. Claim 24 has been added, support for which is found, for example, at page 7, lines 27-31. Claims 1-8 and 22-24 remain pending. Reconsideration and allowance of all pending claims are respectfully requested.

In section 2 of the Office Action, claims 1-3, 5, 6, 22, and 23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Higaki et al., U.S. Patent No. 5,426,340, in view of Yamada et al., U.S. Patent No. 5,889,446. This rejection is respectfully traversed, to the extent it is maintained.

Before discussing the pending claims and cited art, a brief description of a surface acoustic wave ("SAW") device, to which the present application is directed, is provided. In a typical SAW device, an electrical signal applied to a first interdigital transducer ("IDT") is transmitted to a piezoelectric substrate as a mechanical signal. The mechanical signal is transmitted to the second IDT transducer to be turned back into an electrical signal. By appropriately designing the first and second IDTs, specific signals among the electrical signals applied to the first IDT can be transmitted selectively to the second IDT.

Both claims 1 and 22 are directed to such surface acoustic wave ("SAW") devices. Specifically, both claims 1 and 22 recite first and second IDTs formed on a piezoelectric substrate, the piezoelectric substrate including a region of lower resistance (claim 1) or conductive regions (claim 22) between the IDTs. Claims 1 and 22 further recite that the first and second IDTs are not covered with a thin film, and that the first and second IDTs directly contact the piezoelectric substrate.

The rejection states that Higaki discloses a SAW device including a piezoelectric substrate and first and second transducers. This characterization of Higaki is not conceded, but is assumed for the purpose of this amendment only. The rejection states that Higaki fails to disclose a region of lower resistance between the transducers.

The rejection cites Yamada for disclosing a surface 13 with a lower resistance than a substrate 11 located between IDTs. Figure 1B of Yamada shows the thin film 13, having a low resistance and a crystallinity that is different from that of the piezoelectric substrate, that is

formed between the piezoelectric substrate 11 and the IDTs 12. Furthermore, in the device shown in Figure 2, the thin film 113 is formed so as to cover the entire IDT 112. SAW devices configured as disclosed in Yamada are described at page 1, line 30 to page 2, line 6 of the present application. In the SAW device disclosed in Figure 1B of Yamada, the thin film 13 formed directly below the IDTs may be disadvantageous because the mechanical signals transmitted from the IDT may be dissipated before reaching the piezoelectric substrate. Further, the SAW device disclosed in Figure 2 of Yamada may be disadvantageous because the thin film 113 formed to cover the IDTs may cause the characteristics for propagation of the surface acoustic waves to be deteriorated.

The present invention is actually directed at solving the problems associated with the SAW devices disclosed in Yamada. In the SAW devices recited in claims 1 and 22, the IDTs are not covered with a thin film and directly contact the piezoelectric substrate. A SAW device configured as recited in claims 1 and 22 can suppress discharge between IDT electrodes while providing excellent characteristics for propagation of surface acoustic waves. Neither Higaki nor Yamada suggest a SAW device configured as recited in claims 1 and 22.

For at least these reasons, neither Higaki nor Yamada, alone or in combination, render claims 1 and 22, as well as claims 2, 3, 5, 6, and 23 that depend therefrom, obvious. Reconsideration and allowance are respectfully requested.

In section 3 of the Office Action, claim 8 was rejected under section 103(a) as being unpatentable over Higaki and Yamada, and further in view of Ohkubo et al., U.S. Patent No. 5,923,231. In addition, in section 4 of the Office Action, claims 4 and 7 were rejected under section 103(a) as being unpatentable over Higaki and Yamada, and further in view of ordinary skill in the art. These rejections are respectfully traversed, to the extent they are maintained.

Claims 4, 7, and 8 all depend from claim 1 and should therefore be allowable for at least the same reasons as noted above with respect to claim 1. Reconsideration and allowance of claims 4, 7, and 8 are respectfully requested.

New claim 24 is dependent upon claim 22 and should therefore be allowable for at least the same reasons as noted with respect to claim 22 above. Consideration and allowance are respectfully requested.

In view of the above amendments and remarks, claims 1-8 and 22-24 are in condition for allowance. Reconsideration and allowance of all pending claims are respectfully requested. The Examiner is encouraged to contact the undersigned attorney with any questions regarding this application.

Respectfully submitted,
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MARKED-UP VERSION TO SHOW CHANGES MADE

In the Claims

Please amend claims 1 and 22 as follows.

1. (Four Times Amended) A surface acoustic wave device comprising a piezoelectric substrate, a first interdigital transducer and a second interdigital transducer formed on a surface of the piezoelectric substrate so that the first and second interdigital transducers are opposed to each other,

wherein the piezoelectric substrate includes, in the surface between the first and second interdigital transducers, a region having a lower resistance than a resistance of an inner portion of the piezoelectric substrate, and

the first and second interdigital transducers are not covered with a thin film, and the first and second interdigital transducers directly contact the piezoelectric substrate.

22. (Twice Amended) A surface acoustic wave device comprising a piezoelectric substrate, a first interdigital transducer and a second interdigital transducer formed on a surface of the piezoelectric substrate so that the first and second interdigital transducers are opposed to each other,

wherein the piezoelectric substrate includes a plurality of conductive regions spaced apart from each other on [a] the surface [thereof] between the first and second interdigital transducers,

the first and second interdigital transducers are not covered with a thin film, and the first and second interdigital transducers directly contact the piezoelectric substrate, and

a tunnel current flows between the first and second interdigital transducers via the conductive regions.

Please add new claim 24 as follows.

24. (New) The surface acoustic wave device according to claim 22, wherein a material of the piezoelectric substrate is the same as a material of the conductive regions.